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TWO NEW SPECIES OF *COCCIPOLIPUS* (ACARI: PODAPOLIPIDAE) PARASITES OF *CHILOCORUS* SPP. (COCCINELLIDAE) FROM VERA CRUZ AND MORELOS, MEXICO AND FLORIDA AND WISCONSIN, U.S.A.

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Abstract.—***Coccipolipus oconnori*** n. sp. (Acari:Podapolipidae) is parasitic on *Chilocorus stigma* (Coccinellidae) at several localities in Florida and near Sauk City, Wisconsin, U.S.A. and ***Coccipolipus cactii*** n. sp. is parasitic on *Chilocorus cacti* from Vera Cruz and Morelos, Mexico. The new species is closest to the African *Coccipolipus chilocori* Husband 1981. New distributional records of *C. macfarlanei* include Wenatchee, Washington and Castelar, Argentina.

Key Words: Acari, Podapolipidae, *Coccipolipus, Chilororus,* parasite, new species, mites

Mites of the genus *Coccipolipus* are subelytral parasites of coccinellid beetles, with the greatest diversity of known species occurring in Africa (Husband 1972, 1981, 1984a, b). To date, only one species of *Coccipolipus* has been collected from the beetle genus *Chilocorus, C. chilocori* Husband, 1981. During studies of the phoretic associations between the mite genus *Hemisarcoptes* (Hemisarcoptidae) and *Chilocorus,* B. M. OConnor and M. A. Houck of the University of Michigan examined over 5000 museum specimens of *Chilocorus.* Collections representing two new species of *Coccipolipus* from North American *Chilocorus* species were recovered during the study. These species, each restricted to a single species of *Chilocorus,* are described below. All beetles from which *Coccipolipus* specimens were recovered are housed in the U.S. National Museum of Natural History collections unless otherwise noted. Insects are vouchered with labels reading "Mites removed, B. M. OConnor" and a voucher number corresponding to the number on the mite slides.

Measurements were made using a Wild phase contrast microscope with a drawing tube calibrated from a stage micrometer. Terminology is based on Lindquist (1986). All measurements are in micrometers (mm).

Coccipolipus oconnori, NEW SPECIES

Female (Figs. 1, 2).—Gnathosoma longer than wide; length 57, width 41. Cheliceral stylets slender, smooth, length 21. Pharynx length 29, width 23. Gnathosoma usually retracted into sclerotized chamber. Stigmata on slender stalks dorsolateral to gnathosoma. Palps prominent. Tectum covers gnathosoma, length 60, width 45. Idiosoma—smooth, lightly sclerotized; length 445–486, width 251–278. Fully developed females with anterolateral lobes wider than posterior idiosoma. Lightly sclerotized posteroventral internal triangular structure, length 105–148, width 85–125. Legs—two pairs; anterior pair without sucker-like pad, with well developed hooked spine and terminal spine, anterior femoral setae, 5. Leg II with 2 terminal spines, an-

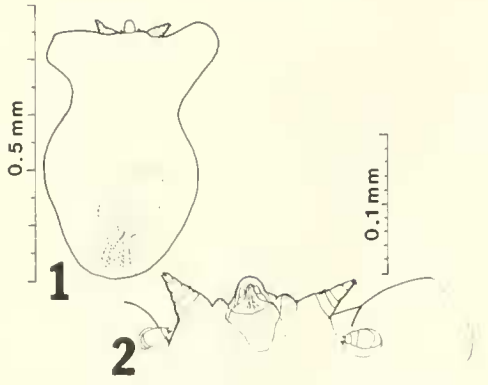

Fig. 1. *Coccipolipus oconnori* n. sp., female, dorsal aspect.

Fig. 2. *Coccipolipus oconnori* n. sp., female, partial ventral aspect.

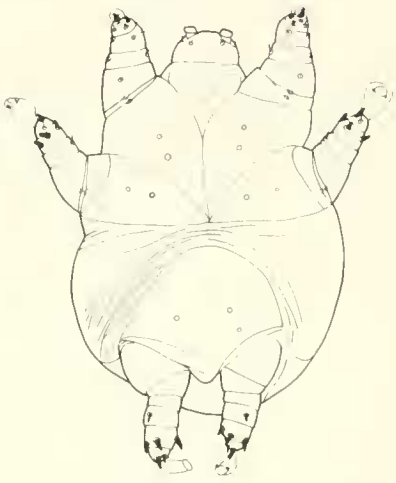

Fig. 4. *Coccipolipus oconnori* n. sp., male, ventral aspect.

terior spine nearly as thick but about ¾ length of posterior spine.

Male (Figs. 3, 4).—Gnathosoma length 22, width 25; dorsal setae microsetae, ventral setae, length 2. Palps 2-segmented, distal segment truncate, basal segment with a short seta. Cheliceral stylets length 8, about ⅓ gnathosomal width. Idiosoma—length 120, width 100. Dorsum-prodorsal plate narrows anteriorly, all setae microsetae. Plates C and D fused, all setae microsetae; triangular aedeagus extends anteriorly beyond posterior margin of prodorsal plate. Venter—slightly sclerotized apodemes 1 and 2 meet medially at sternal apodeme. Coxae III fused, separate from coxae I,II. Legs—leg setation as in Table 1. Leg I with a terminal stout claw and an anterolateral stout spine with 2 adjacent thick setae as long as the spine. Solenidion ω reduced, scarcely longer than width of setal socket. Solenidion ϕ not apparent. Tibia I d seta length 19. Femur II seta present. Tarsi II,III with 2 spine-like setae, ventral spine with an adjacent seta shorter than spine. Ambulacra II, III 15, 12; with minute symmetrically paired claws, length 1. One spine on tibia I, 3 spines each on tibiae II,III, spine lengths 4–5. Tarsus and tibia III longest setal length 6, genu III seta spine-like.

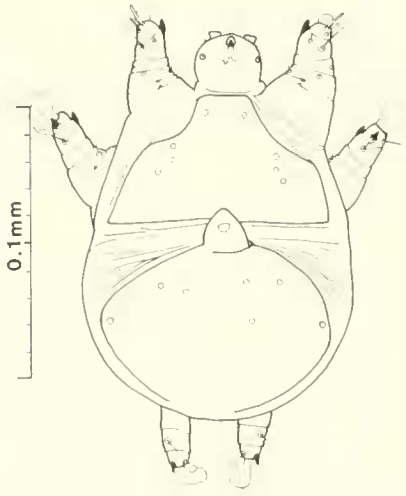

Fig. 3. *Coccipolipus oconnori* n. sp., male, dorsal aspect.

Larval female (Figs. 5, 6).—Gnathosoma length 50, width 50; dorsal setal length 8, less than ⅕ gnathosomal width, ventral setae length 4. Palps 2-segmented, small seta on each segment. Stylets smooth, slender, length 30. Idiosoma—length 186, width 141. Dorsum-prodorsal plate narrowed anteriorly; v_1 4, sc_2 99. Plates C and D fused. All setae microsetae. Plate EF wider than long, setae f length 10. Plate H somewhat trian-

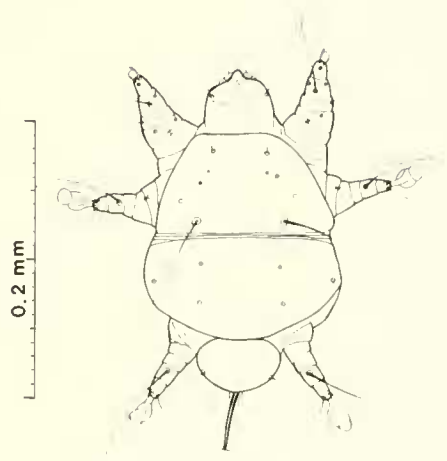

Fig. 5. *Coccipolipus oconnori* n. sp., larval female, dorsal aspect.

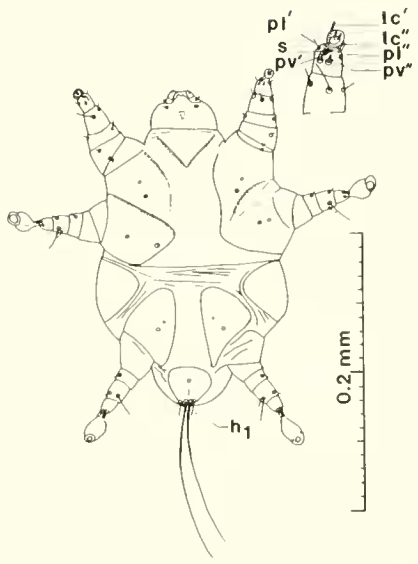

Fig. 6. *Coccipolipus oconnori* n. sp., larval female, ventral aspect. Notation (after Lindquist 1986); pl, primilateral; pv, primiventral; s, subunguinal; tc, tectal; h, setae associated with plate H (6th opisthosomal segment).

gular; setae h_1 length 11, h_2 length 168. Venter-apodemes poorly sclerotized; apodemes 1 and 2 meet medially at anterior sternal apodeme. Coxae III separate from each other and from coxae I,II. Legs—leg setation as in Table 1. Leg I with 2 parallel, terminal claws, solenidion ω length 2. Thick tarsus I pv′ · pv″ setae at base of spine-like s seta. Seta tc′ slightly less than twice length of seta tc″. Tarsi II,III each with setae tc′ and u subterminal, spine-like. Solenidion ϕ no longer than width of setal socket. Ambulacra II,III 28, 25, with minute symmetrically paired claws.

Type data.—Holotype male: Enterprise, Volusia County, Florida, U.S.A., from male *Chilocorus stigma* (Say) (Coccinellidae) collected May 25 (year unknown) by Hubbard and Schwarz. Deposited in the United States National Museum (U.S.N.M.) collection, Washington, D.C. (BMOC 86-0703-18-1). Paratypes (8 males, 20 larval females, 23 females)—same data as holotype. One female (BMOC 86-0703-31-43) and one larval female (BMOC 86-0703-31-42) Hillsboro Co., Florida, collected 7–12 April 1930 by J. C. Bowyer on *C. stigma*. One larval female (BMOC 86-0703-26-440) Brevard Co., Florida on 19 April 1930 by R.A. Schlernitsauer on *C. stigma*. Two females (BMOC 86-0703-27-45, -46) Osceola Co., Florida between 7–12 April 1930 by M. M. Smith on *C. stigma*. Two females (BMOC 86-0703-22-47, -48) Orange Co., Florida on 21 July 1929 by W. A. Miers on *C. stigma*. One female (BMOC 86-0703-19-49) Sump-

Table 1. Total setae on legs of *Coccipolipus* spp. parasitic on *Chilocorus* spp. Solenidia are included.

	Leg I				Leg II				Leg III			
	F	G	Ti	Ta	F	G	Ti	Ta	F	G	Ti	Ta
C. oconnori n. sp.	3	3	6	8	1	1	4	4	0	1	4	4
C. cacti n. sp.	3	3	6	8	1	1	4	4	0	1	4	4
C. chilocori H.	2	3	6	8	0	1	4	4	0	1	4	4

ter Co., Florida, 10–14 Feb. 1930 by B. L. Smith on *C. stigma*. One female (BMOC 86-0703-16-50) Flagler Co., Florida on 21 Dec. 1929 by E. B. Webb on *C. stigma*. Two males (BMOC 87-1023-3-1,-2), 3 larval females (BMOC 87-1023-3-3, -4, -5)) and 6 females (BMOC 87-1023-3-6, -7, -8, -9, -10, -11) Sauk Co., Wisc., on 1 Sept. 1960 by G. Lockwood on *C. stigma*. Three males (BMOC 86-0703-18-2, -3 and BMOC 87-1023-3-1), 4 larval females (BMOC 86-0703-18-9, -10, -11 and BMOC 87-1023-3-3) and 4 females (BMOC 86-0703-18-25, -26, -27 and BMOC 87-1023-3-6) are in the collections of Adrian College, Adrian, Michigan, U.S.A. Three males (BMOC 86-0703-18-4, -5 and BMOC 87-1023-3-2), 3 larval females (BMOC 86-0703-18-12, -13 and BMOC 87-1023-3-4) and 3 females (BMOC 86-0703-18-28, -29 and BMOC 87-1023-3-7) are deposited in the Museum of Zoology, the University of Michigan, Ann Arbor, Michigan. The remaining paratypes are deposited in the U.S.N.M., Washington, D.C.

Etymology.—The species is named for Dr. Barry M. OConnor of the University of Michigan in tribute to his basic studies in the field of acarology.

Diagnosis

Of the 13 species of *Coccipolipus*, only 4 have femoral II setae and 3 of the 4, including *C. oconnori*, have plates C and D completely fused in the larval female stage. *C. oconnori* and the species described below have h_1 setae (length 11) which are longer than the distance between setae h_1. The remaining species, *C. coormani*, has setae h_1 (length 2) which are shorter than the distance between setae h_1. *C. oconnori* has gnathosomal setae which are 20% shorter than the species described below. Setae sc_2, f, femoral I l′ and tibial I l′ are shorter in *C. oconnori* than in the new species described below.

Six of the 13 species of *Coccipolipus* have males with three spine-like setae on tibia III but only 3 species, including *C. oconnori* have spine-like setae on genua III. *C. oconnori* and *C. cooremani* share the 2 characters above while *C. bifasciatus* has 2 spine-like setae on tibia III in combination with spine-like setae on genu III. The tibial III shortest seta in *C. oconnori* is shorter (length 6) than the basal width of tibia III (12) in contrast to the same tibial seta (length 20) in *C. coormani* in which basal width of tibia III is 14.

Adult females of *C. oconnori* and the species described below have femoral I setae (length 5) which do not extend beyond the distal margin of genu I. Five *Coccipolipus* spp. have femoral setae (lengths 13–18) which extend beyond the distal margin of tibiae I. The remaining 6 species lack femoral I setae. Typically, anterior lobes of female *C. oconnori* do not extend beyond the anterior margin of the gnathosoma and the width of the width of the anterior idiosoma is greater than the width of the posterior idiosoma. The two characters contrast with the condition in adult females of the species described below.

Coccipolipus cacti, New Species

Female (Figs. 7, 8).—Gnathosoma length 60, width 48; cheliceral stylets smooth, slender, 23. Muscular pharynx length 35, width 26. Gnathosoma often retracted into a sclerotized chamber. Stigmata on slender stalks dorsolateral to gnathosoma. Palps prominent. Tectum covers gnathosoma, length 60, width 50. Idiosoma smooth, lightly sclerotized; length 260–560, width 200–375. Fully developed females with anterolateral lobes less than or equal to widest part of posterior idiosoma. Lightly sclerotized, triangular, internal, posteroventral, structure, length 90–165, width 76–125. Legs—two pairs; anterior pair without sucker-like pad, with well developed hook-like spine and terminal spine, anterior femoral seta 5. Legs II with 2 terminal spines, anterior spine ½ width and length of posterior spine. Apodemes 1 and 2 thin and weakly sclerotized but conspicuous.

Male (Figs. 9, 10).—Gnathosoma length

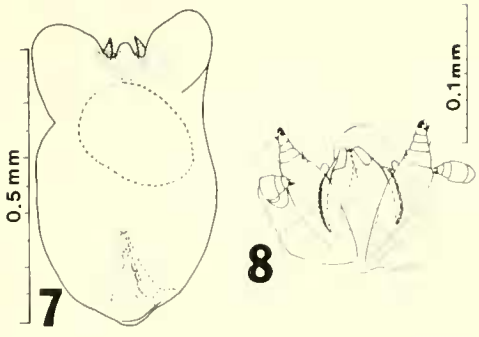

Fig. 7. *Coccipolipus cacti* n. sp., female dorsal aspect.

Fig. 8. *Coccipolipus cacti* n. sp., female, partial ventral aspect.

26, width 29; dorsal and ventral setae 2. Conspicuous muscular pharynx. Palps 2-segmented, distal segment truncate, proximal segment with a short lateral seta. Cheliceral stylets 8, about ⅓ width of gnathosoma. Idiosoma—length 140, width 124. Dorsum-prodorsal plate narrow anteriorly, all setae microsetae. Triangular aedeagus extends beyond posterior margin of prodorsal plate (not evident in Fig. 9 because the specimen was flattened to observe other structures). Venter–slightly sclerotized apodemes 1 and 2 meet medially at the sternal apodeme. Coxae III fused, separate from coxae I,II, coxal setal bases evident but without setae. Legs—leg setation as in Table 1. Leg I with terminal stout claw and anteroventral subterminal spine. Solenidion ϕ not apparent. Tibial setae l′ are small thorns no longer than diameter of setal sockets. Tibia I d seta 22, femur II seta present. Tarsi II,III with 2 spine-like setae; ambulacra II,III 20,18, with minute, symmetrically paired claws. One spine on tibia I, two spines on tibiae II,III, spine lengths 5–6. Tibia III seta 14, tarsus III longest seta 10, about equal to tarsus III basal width.

Larval female (Figs. 11, 12).—Gnathosoma length 44, width 48, dorsal setae 10, ventral setae 8. Pharynx bulb-shaped. Palps 2-segmented, distal segment setal length 3, proximal seta 1. Stylets smooth, slender, length 40. Idiosoma—length 180, width 139.

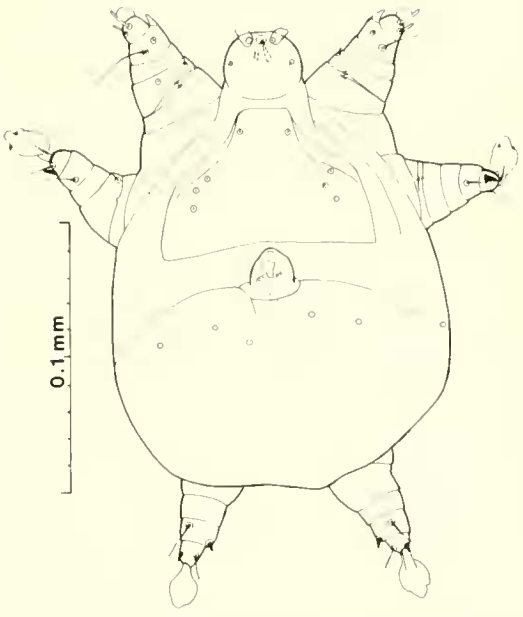

Fig. 9. *Coccipolipus cacti* n. sp., male, dorsal aspect.

Dorsum-prodorsal plate quadrate, narrowed anteriorly; v_1 5, sc_2 127. Plates C and D fused, all setae microsetae. Plate EF wider than long, setae f 12. Plate H somewhat

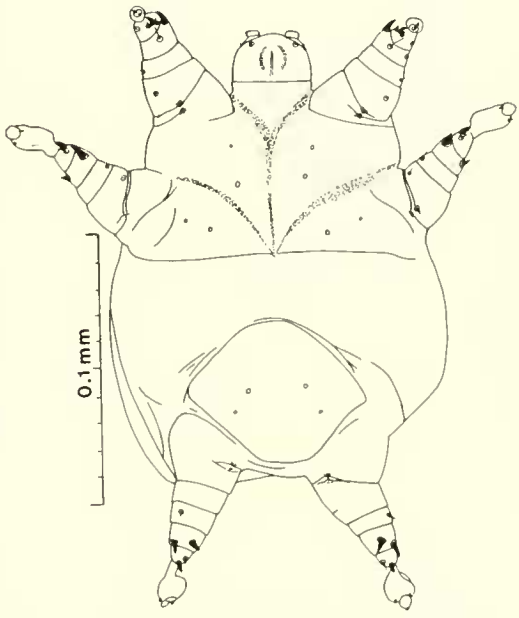

Fig. 10. *Coccipolipus cacti* n. sp., male, ventral aspect.

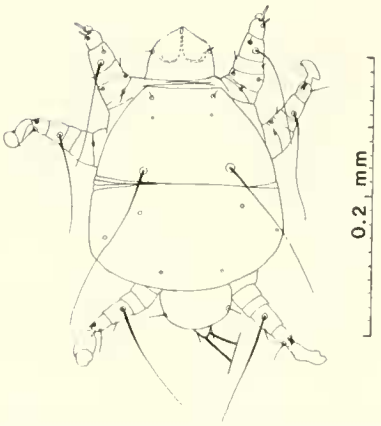

Fig. 11. *Coccipolipus cacti* n. sp., larval female, dorsal aspect.

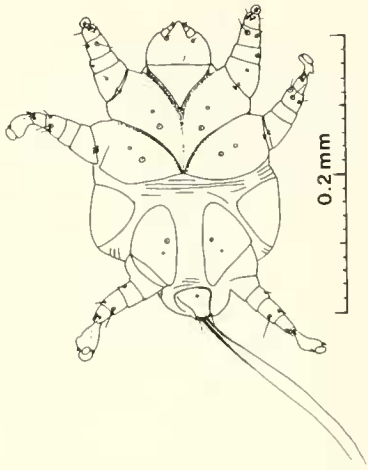

Fig. 12. *Coccipolipus cacti* n. sp., larval female, ventral aspect.

triangular; setae h_1 11, setae h_2 183. Venter-apodemes weakly sclerotized, 1 and 2 meet medially at anterior sternal apodeme. Coxae III separated from each other and from coxae I,II, all coxal setae microsetae. Legs—leg setation as in Table 1. Leg 1 with 2 parallel, terminal claws, solenidion ω no longer than diameter of socket. Setae tc′ slightly more than 2 times length of setae tc″. Solenidion ϕ absent or vestigial. Ambulacra of legs II,III 22 and 30 respectively, with minute paired claws.

Type data.—Holotype male: Cordoba, Vera Cruz, Mexico, on *Chilocorus cacti* (Linnaeus) (Coccinellidae) collected April 21, 1908 by F. K. Knab (BMOC 86-0707-63-1). Deposited in the United States National Museum, Washington, D.C. Paratypes (2 males, 19 larval females, 9 adult females)—same data as holotype. One female (BMOC 86-0918-7-32), 3 miles S. Alpuyeka, Morelos, Mexico, 3400 ft. elev., collected 8 April 1959 by H. E. Evans on *C. cacti*; host beetle in the Cornell University Insect Collection. One male (BMOC 86-0707-63-2), 3 larval females (BMOC 86-0707-63-4, -5, -6) and 2 females (BMOC 86-0707-63-23, -24) are deposited in the collection at Adrian College, Adrian, Michigan. One male (BMOC 86-0707-63-3), 3 larval females (BMOC 86-0707-63-7, -8, -9) and 2 females (BMOC 86-0707-63-25, -26) are deposited in the collections of the Museum of Zoology, the University of Michigan, Ann Arbor, Michigan. One female (BMOC 86-0918-7-32) is deposited in the Cornell University Insect Collection, Ithaca, N.Y. The balance of paratypes are deposited in the U. S. National Museum of Natural History.

Etymology.—The species is named for the host species, *Chilocorus cacti*.

Diagnosis

Coccipolipus cacti is similar to *C. oconnori*. Larval female *C. cacti* have longer cheliceral stylets, gnathosomal setae, and sc_2, f, h_2, femoral and tibial 1 1′ setae. Male *C. cacti* have minute thorn-like tibial setae 1′ while male *C. oconnori* have typical slender tibial 1′ setae. Male *C. cacti* have typical genu III setae while male *C. oconnori* have spine-like genu III seta. Adult female *C. cacti* have anterolateral lobes which extend beyond the anterior margin of the gnathosoma and are less than or equal to the greatest width of the posterior idiosoma. Leg II spines in *C. cacti*, although not equal in length are equal in width. In *C. occonori*, the posterior tarsal spine is nearly twice the thickness of the anterior tarsal spine.

Discussion

Some species of *Coccipolipus* are wide ranging in both host association within Coccinellidae and in geographic distribution, e.g. *C. macfarlanei* on 3 genera of coccinellid beetles on 3 continents. In contrast, *C. chilocori, C. oconnori* and *C. cacti* are restricted to the genus *Chilocorus* and each to a portion of a continent. *C. chilocori* occurs on 5 species of *Chilocorus* in Central Africa, *C. cacti* occurs on one species in Mexico and *C. oconnori* occurs one one species in the Eastern United States. This discussion is limited to the 3 species of *Coccipolipus* associated with *Chilocorus* spp.

African *C. chilocori* are larger, have longer setae in general and longer leg setae specifically in females, males and larval females than their counterparts *C. cacti* and *C. oconnori* in North America.The idiosomal length of larval female *C. chilocori* is about 1.2 times the length of the American species but gnathosomal setae are 2 to 4 times longer than the American species. Comparisons of the longest tibial and tarsal III setae in males and femoral setae in females give ratios of 2 to 6 times longer than in the American species.

Although males of all 3 species are similar in that all idiosomal are microsetae, the aedeagus of *C. chilocori* extends farther forward and is nearly equal to the width of the gnathosoma. The aedeaguses of *C. oconnori* and *C. cacti* are at most ¾ the width of the gnathosoma. Femoral I, II, III setal patterns in male and larval female *C. oconnori* and *C. cacti* are 3-1-0 whereas the pattern in the African species is 2-0-0. Patterns on genua, tibiae and tarsi are similar. Empodia are conspicuously longer and more slender in male and larval female *C. chilocori* than in American species.

Since the genus *Chilocorus* is found in both hemispheres and has a wide distribution pattern, it is likely that additional *Coccipolipus* will be discovered. At this point, it may be stated that there are differences in numbers of setae, setal lengths and size of structures between *Coccipolipus* from African *Chilocorus* and *Coccipolipus* from North American *Chilocorus*. The differences are consistant in the species studied.

Additional distribution records of *Coccipolipus* spp.

In addition to records cited above and in Husband(1984b), *Coccipolipus macfarlanei* Husband 1972 is now known from *Coccinella transversoguttata* (Fald.), 6 mi. N. of Wenatchee, Washington, U.S.A. (Devin Carroll, personal communication, 1983) and from *Eriopis connexa* (Germ.) in Castelar, Argentina (Alida Bolart, personal communication, 1983).

Acknowledgments

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